

Applicants would like to point out that it is well-founded that "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987), and "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed. Cir. 1989).

The subject invention, as claimed in claim 1, concerns the detecting of motion at a temporal intermediate position between a previous and a next image, in which the method comprises optimizing a criterion function for candidate vectors, said criterion function depending on data from both the previous and next images, the optimizing being carried out "at the temporal intermediate position in non-covering and non-uncovering areas". In particular, the optimizing is carried out "at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas."

The Examiner has indicated in the rejection that the above limitations may be found in Hazra et al. at col. 1, lines 52-66.

This portion of Hazra et al. states:

"Additionally, the best-matched block for each interpolated block is selected from the current winning block for each list based on an error criterion and an

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overlap criterion. The interpolated frame is synthesized based on the best-matched block for each interpolated block.

"In another embodiment, a method includes selecting a zero motion vector for a given pixel in an interpolated frame upon determining a current pixel in a current frame corresponding to the given pixel in the interpolated frame is classified as covered or uncovered. The interpolated frame is synthesized based on selecting the zero motion vector for the given pixel in the interpolated frame upon determining the current pixel in the current frame corresponding to the given pixel in the interpolated frame is classified as covered or uncovered."

Applicants submit that while Hazra et al. mentions the terms "covered" and "uncovered", a careful reading of the above will indicate that there is not disclosure in Hazra et al. "that the optimizing is carried out at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas."

In response thereto the Examiner now states:

"Hazra '313 (figs. 3 and 4) discloses, process for determining best motion vector (candidate vectors, best match) between the current/new image/frame (as covering area), which has its own vector (which also consider next image with respect to the previous image) and previous image/frame (as uncovering area), which are situated temporally between the frames/blocks. The best-matched vector is being selected, is in fact a process of optimizing."

Applicants submit that the Examiner is mistaken. In particular, Fig. 3 is a block diagram showing merely 4 blocks, to wit, classifying pixels 300, dividing the framing into blocks 302, determining a best motion vector 304 and synthesizing the

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interpolated frame 306. Fig. 4 merely shows a previous frame with a particular block 406, a current frame in which, due to motion, the corresponding block is 410, and the interpolated frame where the corresponding block is 408. It should be apparent that these two figures do not show that in non-uncovered and non-covered areas optimizing is carried out at the temporal intermediate position, in covering areas, optimizing is carried out at the temporal position of the next image, and in uncovering areas, optimizing is carried out at the temporal position of the previous image.

Further, from the Examiner's statement, it is apparent that there is a misunderstanding of the meaning of the terms "covering" and "uncovering". In particular, the terms "covering" and "uncovering" do not mean the current image and the previous image, respectively. Rather, "covering" and "uncovering" are related to motion vectors in the vicinity of an edge. A detailed description of "covering" and "uncovering", as indicate in the subject specification on page 3, line 3, may be found in International Patent Application No. WO 00/11863 (a copy of which is enclosed herewith along with form PTO/SB/08a).

In Hazra et al., use is made of the forward motion vector or the backward motion vector. However, in the event that a pixel is classified as either covered or uncovered, a zero motion vector is chosen (see col. 6, lines 63-67). As such, Hazra et al. definitely does not disclose the limitation "that the optimizing is

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carried out at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas."

Claim 3 states "the criterion function is a match error which is minimized."

The Examiner indicates that this is shown in Hazra et al. at col. 6, lines 25-35, which states:

"In FIG. 5, block 514 is performed in one embodiment by the method of FIG. 8, as the final motion vector is selected from one of the candidate lists. In FIG. 8 in block 808, the selection criterion from among the three candidates, Forward Motion Vector (FMV) Candidate 802, Backward Motion Vector (BMV) Candidate 804 and Zero Motion Vector (ZMV) Candidate 806, from the candidate lists uses both the block matching error (MAD or the Sum of Absolute Difference (SAD)) and the overlap to choose the best motion vector. The rationale for using the block matching error is to penalize unreliable motion vectors even though they may result in a large overlap."

Applicants submit that it should be clear from the above that while Hazra et al. arguably does perform a block matching error to choose the best motion vector, this is not what is done in the invention as claimed. Rather, claim 1 states that "optimizing (of the criterion function) is carried out at the temporal intermediate position in non-covering and non-uncovering areas", and that "optimizing (of the criterion function) is carried out at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas."

Applicants submit that it appears that Hazra et al. is performing a block match error analysis on all the motion vector candidates as opposed to, selectively, the forward motion vectors, the backward motion vectors, and the zero motion vectors. In the subject invention, depending on whether there is covering or uncovering, or areas of non-uncovering or non-covering, optimization is performed at differing temporal positions, i.e., the temporal position of the interpolated image, the temporal position of the next image, or the temporal position of the previous image.

The Sun et al. patent discloses motion estimation within a sequence of data frames using optical flow with adaptive gradients, in which Sun et al. "mentions" the terms "occlusions" and "edge" (at col. 3, lines 5-50).

However, Applicants submit that Sun et al. neither shows nor suggests determining a velocity edge, marking an occlusion area around the determined edge, and replacing the foreground velocity by background velocity or reversibly dependent on whether the occlusion area is a covering or uncovering area, the sign of the foreground velocity and on which side of the velocity edge the foreground is (as specifically claimed in claim 7).


Furthermore, since the rejection is the combination of Hazra et al. and Sun et al., Applicants submit that Sun et al. does not supply that which is missing from Hazra et al., i.e., "that the

optimizing is carried out at the temporal position of the next image in covering areas and at the temporal position of the previous image in uncovering areas."

In view of the above, Applicants believe that the subject invention, as claimed, is neither anticipated nor rendered obvious by the prior art, either individually or collectively, and as such, is patentable thereover.

Applicants believe that this application, containing claims 1-25, is now in condition for allowance and such action is respectfully requested.

Respectfully submitted,

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